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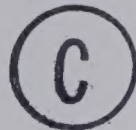
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AN ECONOMIC ANALYSIS OF LABORATORY
SERVICES IN MANITOBA

BY



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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
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ABSTRACT

Cost pressures in health are necessitating an

examination of our health system to ensure that

University of Alberta

resources are being used in the most efficient manner. This

Faculty of Graduate Studies

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efficient parts within the segments and to redirect resources

The undersigned certify that they have read, and recommend
to the Faculty of Graduate Studies for acceptance, a thesis
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MANITOBA submitted by Richard A. Paterson in partial ful-
fillment of the requirements for the degree of Master of
Health Services Administration.

ABSTRACT

Cost pressures in health are necessitating an examination of our present health system to ensure that resources are being utilized in an efficient manner. This examination will enable decision makers to recognize the efficient parts within the segments and to redirect resources to these parts. The primary objective of this thesis is to examine the laboratory system in Manitoba and to evaluate its ability to assess efficiency and inefficiency in this system.

The basic conclusion of this thesis is that the present methods are inadequate and unable to assess efficiency in the system. This problem is aggravated by a general lack of personnel with administrative expertise in the field and an essential economic framework to achieve this objective.

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TABLE OF CONTENTS

	Page
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS.	v
LIST OF TABLES	vi
LIST OF FIGURES.	vii
CHAPTER	
I Introduction	1
II The Background to the Health Delivery System .	4
III Theoretical Framework.	27
IV Output and Cost Measurements In The Present Laboratory System	34
V Critical Analysis and Evaluation of the Unit Value System	42
VI SUMMARY, CONCLUSIONS AND RECOMMENDATIONS . . .	57
BIBLIOGRAPHY	63
APPENDIX List of Hospital Districts in Manitoba	66

LIST OF TABLES

Table	Page
I Cost and Unit Statistics for the Winnipeg General Hospital and St. Boniface Hospital for 1967 and 1968	
II Statistics for Metro-hospitals for 1968 . .	

.....
LIST OF ILLUSTRATIONS

Figure		Page
I	Hospital Districts in Manitoba	
II	Metropolitan Winnipeg Divided Into Census Tracts and Locations of Hospitals	

CHAPTER I

Introduction

The cost of laboratory services represents a significant and growing portion in the budget of the Manitoba Health Care System. Their cost was approximately \$4.7 million dollars in 1967, \$5.7 million dollars in 1968, and will substantially exceed this figure in 1969. In 1971, the combined budgets of all Manitoba hospitals will exceed \$55 million dollars.¹ Thus the cost of laboratory services represents at least five percent of the total health bill in Manitoba.

Purpose

The purpose of this thesis is to examine the laboratory services section of the Manitoba Health Care System and to analyze existing output measures in terms of their utility for assessing efficiency in the laboratory delivery system. Efficiency is being defined as the attainment of a maximum output with the least-cost combination of inputs.

K.C. Charron indicated that health systems progress through four steps as they develop to the public level. He defines the public service system as:

Under this system the direct responsibilities of the plan are the financing of health services and the concern with its quality, availability and effective utilization.²

1. Morison, James B., The Delivery of Health Care, Children's Hospital Publication, Winnipeg, 1970, p.1.

2. Quoted in Nestman, L., An Examination of Health Care Plans in Canada, Thesis, University of Alberta, 1970, p.7.

The province of Manitoba, by Charron's criteria is beginning the public service level. This is supported by a statement made by Dr. James B. Morison, the new chairman of the Health Services Commission:

The cost of providing health services has risen so rapidly in recent years that, in the words of a recent Federal-provincial task force investigating these costs we have three alternatives: to reduce the standards of health care; or to raise taxes and premiums even higher; or to search for ways to restrain cost increases through better operation of the health service system. It is to the third alternative that we should direct our efforts.

We have now reached the point where more than ever before all persons, government and providers of health services, as well as the receivers of these services, must work together to control rising costs while at the same time protecting the essential elements of good health care.¹

The Manitoba Health Services Commission has accepted the direct responsibility for assessing the quality, availability and effective utilization of laboratory services. Etzioni states that effectiveness of a specific organization is determined by the degree to which it realizes its goals.² Given that one of the Manitoba Health Services Commission's goals is to control rising costs through better operation of the health service system, introducing efficiency measures must be one of their prime concerns. Efficiency is to be measured by the amount of resources used to produce a unit of output.³

1. Morison, James, B., The Delivery of Health Care, Children's Hospital Publication, Winnipeg, 1970, p.1.

2. Etzioni, Amitai, Modern Organizations, Prentice-Hall Inc., New Jersey, 1964, p.8.

3. Ibid.

An initial study was undertaken to assess efficiency in the present laboratory delivery system. This study was to be a comparative analysis between institutions, units, and provinces. This preliminary investigation revealed a fundamental weakness that required solution before this study could be carried out. The absence of an adequate measure of output to relate to costs and inputs was evident and this thesis will focus on this problem in the system. Rational planning of the delivery of laboratory services in the future necessitates an assessment of efficiency and effectiveness in the present system.¹

Format

Chapter I presents the purpose, the justification and need for this study. Chapter II presents an overview and the inter-relationships within and between the systems. Chapter III outlines the theoretical framework. Chapter IV discusses the output and cost measurements in the present laboratory system and what these measurements are utilized for. Chapter V presents the analysis and evaluation of the present system. Chapter VI presents the summary, conclusions and recommendations.

¹. Stein, Jess., Modern American Dictionary, Dell Publishing Co., New York, 1961, p.441 Rational means endowed with or based on reasoning.

CHAPTER II

The Background to Health Delivery System

The health care system in Canada is made up of consumers and producers. Producers are represented by professional and paramedical personnel, practising in a mix of private and publicly owned facilities. The Royal Commission on Health Services states that:

the individual's responsibility for his personal health and that of the members of his or her family is paramount to the extent of the individual's capacities.¹

Further, individual responsibility includes the wise and prudent use of health services and the financial support for the cost of the provision of health services and resources. However, the bulk of the responsibility for the provision of health care has been vested by society in government and professional bodies. Delegation of authority to professional groups, hospital boards and government commissions has occurred with varying levels of representation for the community.

With the passage of the B.N.A. Act, the legal provision of health care became primarily a provincial concern. Municipal governments are creations of provincial governments and some of the legal responsibilities regarding the provision of health care have been vested in them. Inadequate revenue producing power and financial resources have undermined provincial powers in this sphere. The

¹. Royal Commission on Health Services, Toronto, Queen's Printer, 1964, p.3.

federal government, by utilizing their greater financial resources in support programs, has effected substantial changes in provincial programs. In addition, the federal government provides and operates their own health facilities in each of the provinces. These are supplementary to, and outside of, the control of the provinces.

The Manitoba Health Care System

The Manitoba Health Care System is a subset of this system. The various private and public health facilities are influenced by government agencies. The Department of Health, the Manitoba Hospital Commission and the Manitoba Health Services Insurance Commission were established by the provincial government to have prescribed authority over public health, hospital services, and medical services. Their responsibilities have been defined and redefined by legislative developments. These agencies have played a significant role in the development and delivery of health services in Manitoba. Demographic factors and the methods of payment, the distribution and number of facilities, have also had a significant impact on the health care system.

Demographic Factors

The distribution of population has affected the development and delivery of health care in the Province of Manitoba. The concentration of population and specialized health facilities in metropolitan Winnipeg has had a dominant influence on the development and patterns of health

HOSPITAL DISTRICTS IN MANITOBA

38

Lowell State Hospital
High Hospital

Kreschot Nursing Station
 Cross Lake W.S.
 Garden Hill W.S.
 Gillan
 God's Lake W.S.
 Little Grand Rapids S.S.
 Lynn Lake W.S.

Pelson House N.S.
 Norway house I.h.
 Oxford house N.S.
 Pakatsungen N.S.
 Ste. Therese Point N.S.
 South Indian Lake N.S.
 Split Lake N.S.

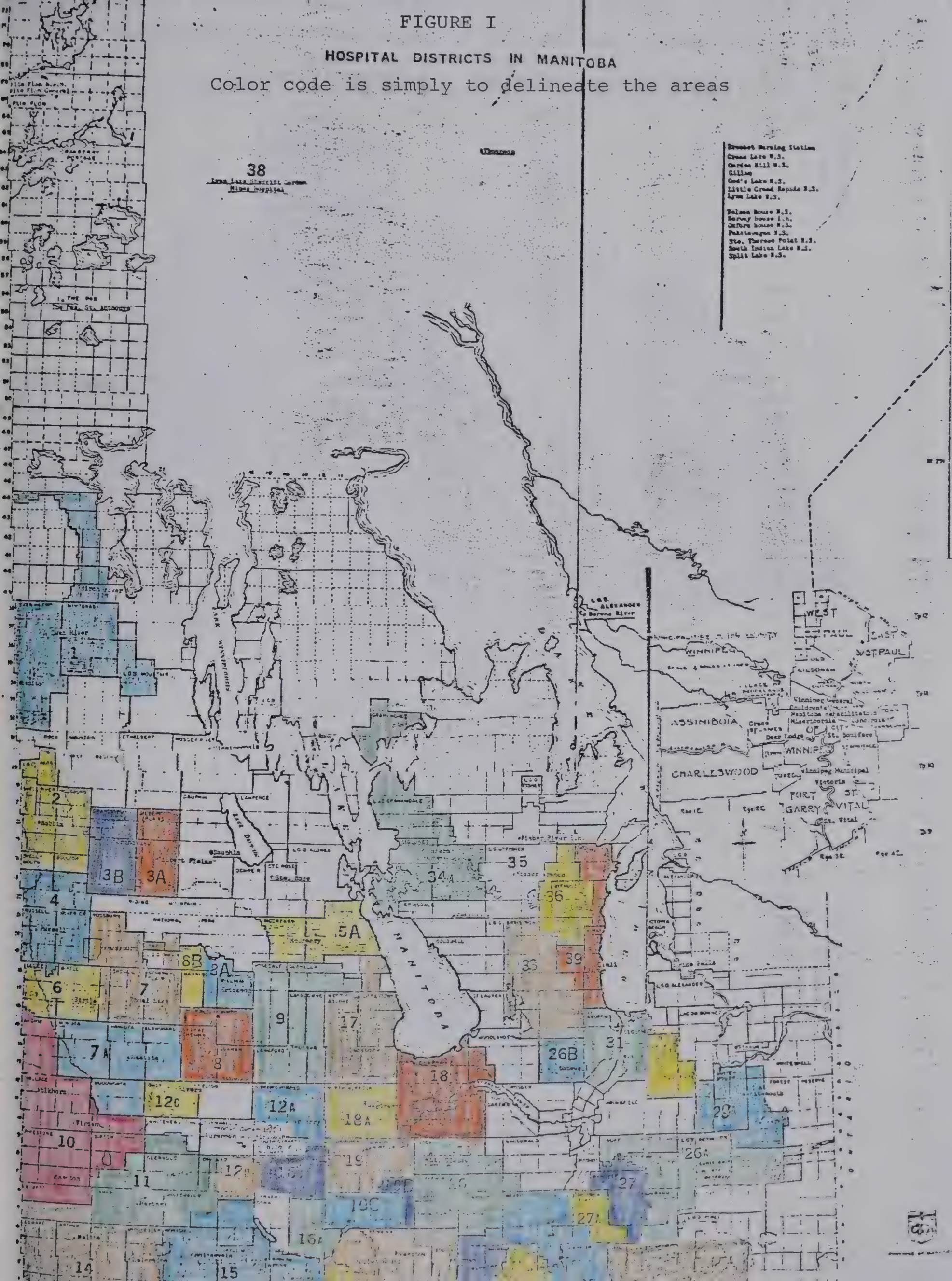
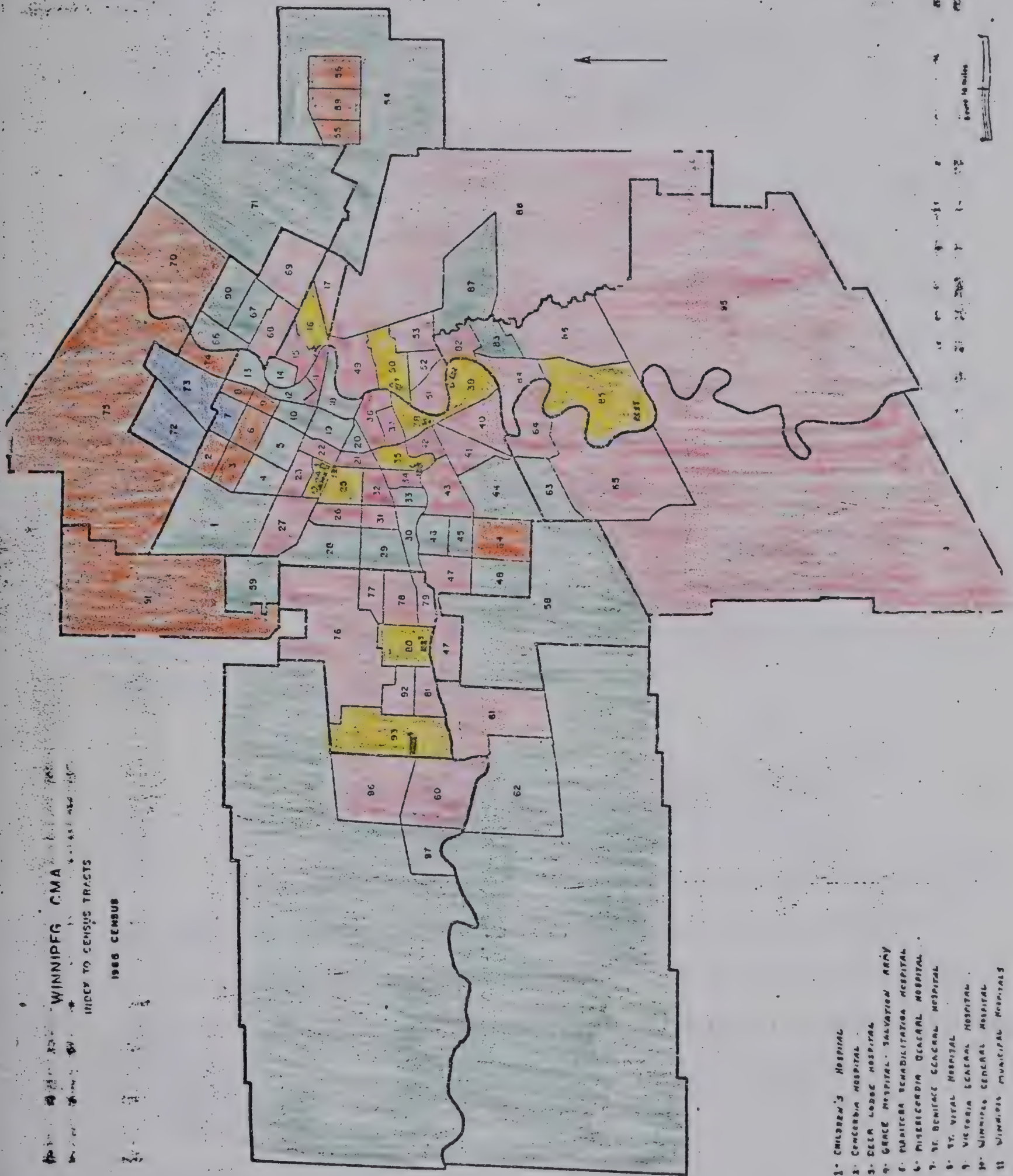


FIGURE II

Metropolitan Winnipeg Divided Into Census Tracts and Locations of Hospitals

Color code is simply to delineate the areas.



delivery.¹

In 1965 the population of Manitoba was 962,000. About 64% of the population was classified as urban and about 36% as rural. Slightly more than one-half of the total resided in the Winnipeg Metropolitan area.²

This has been accompanied by a concentration of specialized health facilities and personnel in this area. Thus, a resultant disparity has developed in the availability of health care between rural and urban residents which has caused considerable concern in the province.³ The following map illustrates the province broken into geographical areas or hospital districts. These hospital districts in rural Manitoba have approximately twenty-five hundred people in each district. The second map illustrates metropolitan Winnipeg broken into census tracts and the geographical location of the hospitals.

Legislation Affecting the Delivery,
and Structural Organization
of the Manitoba Health Care System

The hospital services insurance program began in Manitoba on July 1, 1958, with the establishment of the Manitoba Hospital Services Plan.⁴ This followed the Federal Hospital Insurance and Diagnostic Act which offered financial

1. Health Care Series No.20, Research and Statistics Directorate, Dept. of National Health and Welfare, Ottawa, 1966, p.129.

2. Ibid.

3. Ibid, p.130. Rural has been defined as outside metropolitan Winnipeg and urban as inside metropolitan Winnipeg.

4. Manitoba Hospital Commission Annual Report, Winnipeg: Queen's Printer, 1969, p.4.

support to provincial plans. Under this plan, all in-patient diagnostic services were provided as an insured benefit for all legal residents of Manitoba. Out-patient diagnostic services were not covered by this plan unless the required services were due to an accident which was reported within twenty-four hours. However, coverage for out-patient diagnostic services could be obtained under private insurance plans.

On April 1, 1969, medical insurance was introduced in Manitoba.¹ At the same time all out-patient diagnostic and treatment services provided in hospitals became insured services under the hospital insurance program. This legislation again resulted from Federal legislation offering financial support. Thus, virtually all diagnostic services were provided as insured benefits under these two plans.

From the inception of the hospital insurance program until 1962, the plan was administered by a commissioner who was directly responsible to the Minister of Health. In 1962, the Manitoba Hospital Commission came into being by an act of legislation and assumed the administration of the Hospital Services Plan under the Hospital Services Insurance Act (Chapter 30, Statutes of Manitoba 1962).²

1. Ibid.

2. Ibid.

In addition to the administration of this program, the Commission's responsibilities, as established under The Department of Health Act, include the administration of The Hospital's Act, the Private Hospitals Act and Part IV of The Health Services Act. Responsibilities under legislation include licensing and inspection of hospitals. Under The Health Services Act, The Commission carried out the general administration of the program through which hospital services are provided by municipal hospital districts in rural areas.¹

The Commission is also responsible for province-wide planning and development of hospitals and for the general standard and evolution of hospital services.²

Prior to April 1st, 1969, private medical insurance was available through Manitoba Medical Services, a private, non-profit organization, or from private insurance companies. In 1967, the legislature established the Manitoba Medical Services Insurance Corporation.³ This body was charged with the responsibility of developing a plan for the implementation of government medicare. The Corporation formed a contractual relationship with Manitoba Medical Services for the handling of claims processing. "In January of 1969, the Chairman of the Manitoba Hospital Commission became Chairman of the Manitoba Medical Services Insurance Corporation."⁴ In April 1969 with the advent of the Manitoba Health Plan, the Manitoba Medical Services

1. Ibid.

2. Ibid.

3. Ibid.

4. Ibid.

Organization was dissolved, as was the previous contractual arrangement. Thus, the provision of medical care insurance was brought under the control of the Manitoba Medical Services Insurance Corporation. With the coverage extended to include chiropractic and optometric services, the name was changed to more adequately reflect its function. The new name became the Manitoba Health Services Insurance Corporation.¹

On the 21st of October, 1970, The Health Services Insurance Act was proclaimed and a new commission was established to administer this Act. The new commission consists of seven members, three of which are physicians, The powers of the new Commission are:

- (a) to provide insurance for residents of Manitoba in respect of the costs of hospital services, medical services and other health services; and
- (b) to plan, organize and develop throughout the province a balanced and integrated system of hospitals and related health facilities and services commensurate with the needs of the residents of the province.²

The duties of the Commission are:

- (a) administer this act;
- (b) recommend to the minister in respect of each year, a program, including an operating budget and a capital budget;

1. Bill 33/69, Winnipeg: Queen's Printer, 1969.

2. Bill 98, The Health Services Insurance Act, Thirtieth Legislature, 20 Elizabeth II, Winnipeg: Queen's Printer, 1970, p.8.

- (c) carry out such surveys and research as, in the opinion of the Commission, are necessary for its purposes or make such arrangements as are necessary to ensure that such surveys and research are carried out; and
- (d) carry out such public educational programs, alone or in co-operation with others, as, in the opinion of the Commission are necessary or make such arrangements as are necessary to ensure that such educational programs are carried out.¹

This Act provides for the amalgamation and continuation of the programs under the former Manitoba Health Services Insurance Corporation and Manitoba Hospital Commission. The formation of the new commission is an initial step towards a broader concept of planning and provision of health services with the emphasis shifted to health rather than care.² The functional amalgamation of the two agencies has not as yet occurred and until it does occur the previous structure will operate.

The Paying Agencies

The existing Manitoba Hospital Commission is under the authority of a five-member board which includes the Chairman who is also the Chief Executive Officer. The Chief Executive Officer and the Commission have a staff relationship with medical, legal and architectural

1. Ibid.

2. Morison, James B., The Delivery of Health Care Children's Hospital Publication, Winnipeg. 1970, p.1. Dr. Morison uses health in a preventive sense meaning the emphasis will be shifted to prevention of diseases rather than the treatment of disease.

consultants. The internal functional organization is as follows: Directly under the Chief Executive Officer the structure is divided into three main divisions--Research and Planning; Finance; and Hospital Services.

The Hospital Services Division includes the Claims Section, the Consultants' Section, and the Emergency Health Services Section. The Claims Section received individual patient claims from hospitals which are medically reviewed, processed for payment and coded for statistical records. The Consultants' Section carries out visits to hospitals for purposes of inspection, also providing assistance to hospitals on request in various areas of hospital operation. The Emergency Health Services Section is responsible for the health planning portion of the Manitoba Emergency Measures Organization and for planning in the field of ambulance services.

The Research and Planning Division is involved in all areas of the Commission's operations. It includes the research and statistics section which prepares financial forecasts and statistical reports and conducts special studies. A major activity is the planning for future development of hospital facilities and services throughout the province.

The Finance Division is made up of four sections: Registration; Billing; Hospital Budgets; and Data Processing and General Accounting. The Registration and

Billing Sections co-ordinate the registration and premium collection program for residents of the province. The Hospital Budgets Section reviews hospital budgets to establish annual rates of payment to hospitals. The Data Processing Section maintains computerized records and accounts, issues premium billings and compiles statistical data.

Finally, the Construction Division co-ordinates the Commission's activities on hospital planning and construction including the assessment of hospital submissions and the development of financial budgets for projects.¹

The Commission is financed through premiums, grants from the Provincial Treasury and contributions from the Federal Government. The Federal Government contributes to the cost of insured services as follows:

- (a) twenty-five percent of the per capita cost of services in Canada (the national average) and;
- (b) twenty-five percent of the per capita cost of services in Manitoba (the provincial average);

multiplied by the number of insured persons in Manitoba. Federal Government contributions do not apply to depreciation on buildings, interest charges, and the administration expenses of the Commission which are borne as provincial costs.²

This is the internal structure and financing of one of the government agencies involved in health care and diagnostic

¹. Manitoba Hospital Commission Annual Report, Winnipeg: Queen's Printer, 1969, pp.5-10.

². Ibid, p.13.

services.

The Manitoba Health Services Insurance Corporation is directed by a seven-member board. Under the Chairman is a secretary and Chief Medical Officer. Beyond this basis, administration is purchased from the Manitoba Hospital Commission. The amount has been arbitrarily set by the boards. The Corporation is financed through premiums, grants from the Provincial Treasurer and contributions from the Federal Government. The Federal share is based on ninety percent of the estimated national cost per capita, multiplied by the provincial population as determined from the census.

Facilities in the Manitoba Health Care System

There are many facilities of various types in Manitoba. Hospitals provide the major source of facilities but facilities provided by the Department of Health and individual physicians are also significant. All hospital facilities and those provided by the Department of Health are included in the public sector. The public sector includes all services and facilities which are: financed solely or in part by public funds through a government agency; open and available to all the public and not operated on a profit basis.¹ The facilities provided by

1. 1969 Instructions and Definitions for the Annual Return of Hospitals, Dominion Bureau of Statistics, Department of National Health and Welfare, Ottawa: Queen's Printer, 1969, p.6-11 Public--Applies to a Hospital.

individual physicians or groups of physicians are included in the private sector. The private sector includes all facilities not in the public sector.

The Public Sector

There are one hundred and nine public hospitals in Manitoba, eleven of which are located in metropolitan Winnipeg. The hospitals located in rural Manitoba for the most part have less than fifty beds.

Sixteen of the public hospitals are owned and operated by the Federal Government. The Deer Lodge Hospital located in Winnipeg is significantly larger than the other fifteen. The remainder of the Federal hospitals are located in the northern area of the province serving isolated pockets of civilization. Health care is provided to special segments of the population such as war veterans, Indians and Eskimos with these facilities.

Five public hospitals are owned and operated by industrial concerns in areas of industrial development for mining purposes. These locations were usually isolated and without adequate health facilities. These facts forced industry to supply adequate health facilities and personnel to attract and maintain their labor force. The level of care available in these locations has risen not only for the workers of the industry but for everyone, as all have access to the facilities.

Eleven public hospitals are owned and operated by religious organizations. Initially religious hospitals were constructed to meet community needs that the community was unable to meet. This financial responsibility is now being largely handled by the community but the ownership and operation of these hospitals has not been changed.

Another fifty-one public hospitals form part of the nine diagnostic units. In these hospitals the diagnostic facilities are owned and operated by the provincial department of health. The diagnostic units are located in rural Manitoba and have been one means utilized to reduce the disparity in availability of health care for rural residents.¹

A portion of Manitoba has been organized into nine districts each having laboratory and x-ray units. These units provide basic diagnostic services to the legal residents of these districts. They are established by local option on approval of the hospital, municipal councils or other concerned persons. Staffs are employed and paid directly by the Provincial Department of Health and Social Services. Units are owned and operated by the Provincial Department of Health and Social Services. Diagnostic Units

¹. The Health Services Act, Winnipeg: Queen's Printer, 1965

established in areas without health units come¹ under the direct administration of the Department of Health and Social Services. If they are located within a health unit they are under the supervision of an advisory board. The advisory board is made up of one or more representatives from the council of each contributing municipality, town or village: at least two representatives appointed directly by the Minister, one of whom must be a local physician; and the medical director of the unit. This system has been governed by the Manitoba Health Services Act since 1945.² Local laboratory and x-ray facilities have been located in community health centres within or adjacent to local hospitals.

In addition to hospital facilities or facilities owned and operated by others but located in hospitals, are the provincial laboratories. There are three provincial laboratories located in Winnipeg, Brandon and Dauphin. They do not provide services directly to patients but serve as specimen referral centres. In addition to this function, provincial laboratories provide major services to the environmental control programs in the province, and serve as training centres for the future staffing of the diagnostic units in rural Manitoba. These facilities are owned and operated by the Department of Health and Social Services

1. The Health Services Act, Winnipeg: Queen's Printer, 1965 pp.4-9. A health unit is a district organized to provide health services. The services provided are quite extensive and include environmental health services. For a complete reference to existing legislation covering all aspects of health units refer to the Health Services Act.

2. Ibid. pp.9-13.

but are under separate administration from the diagnostic units.

The Private Sector

The private sector encompasses all approaches utilized by physicians to provide their services. Physicians can work individually, as part of a clinic with other physicians in other specialties, or as part of a group of physicians in the same specialty. In addition, physicians can be hired personnel of medical institutions.

Methods of Payment

There are several methods of payment utilized for the public sector. Most of the public hospitals submit budgets annually to their financial source, the Manitoba Hospital Commission. The resultant negotiated figure includes all cost components for delivery of the services. The individual hospitals then make private arrangements either contractual or salary for the provision of the professional requirements of the services. The technical cost components are paid by the Hospital Commission on the basis of cost while the professional component is usually related to volume and the Manitoba Medical Schedule of Benefits.¹

Public hospitals owned by industry are paid on the basis of a per diem rate which covers the costs incurred in

1. Summary of Policies, Laboratory and Radiology Services, Manitoba Medical Services Insurance Corporation, Winnipeg, 1969.

the provision of all services. The per diem rate is set in two ways. It will be the same as the per diem rate of a similar size and type of hospital, or the per diem rate of the hospital itself will be accepted after an audit by the Commission. Federal hospitals are treated in a similar manner. They receive per diem payments from the Hospital Commission for veterans and other patients not paid for by the Federal Government.¹

Diagnostic units utilize a different method of payment. The hospitals in which units are located present an annual budget to the Hospital Commission. This budget includes expected costs of operation of the diagnostic units. The Hospital Commission negotiates with and pays the individual hospital, who in turn pay the Department of Health and Social Services for the operation of all unit facilities.

Provincial laboratories finance their operations by still another method of payment. Presently their financial support comes from two sources, the Provincial Treasury and the Manitoba Hospital Commission. The Commission pays for all laboratory tests performed on patient specimens collected in hospitals. The remainder of the cost is paid by the Provincial Treasury.

The private sector has two sources of finances,

1. Ibid.

the Manitoba Health Services Insurance Corporation and private patients. The Manitoba Health Services Insurance Corporation will make payments to all registered facilities¹ and to individuals upon presentation of proof of receipt of services. Payments are made on a fee-for-service basis and are based on the Manitoba Health Services Insurance Corporation's Schedule of Benefits.² The Schedule of Benefits includes all cost components and profit for providing the services. The Manitoba Health Services Insurance Corporation will only make payments directly to opted-in facilities or physicians. Opted-in facilities or physicians are those that elected to receive payments directly from the government agency at the negotiated rates. Opted-in facilities and physicians by accepting payment directly, gave up their right to extra bill their patients. To extra bill is to charge an amount over and above that listed in the schedule for the same test.

Facilities and physicians that have chosen not to receive payments directly from the government agency get paid directly by their patients. These patients by submitting a claim to the Manitoba Health Services Insurance Corporation, receive payment according to the Schedule of Benefits. The government agency has no control over the

1. Summary of Policies, Laboratory and Radiology Services, Manitoba Medical Services Insurance Corporation, Winnipeg, 1969, p.3.

2. Manitoba Medical Plan, Manitoba Medical Services Insurance Corporation, Winnipeg, 1969, pp.26-39.

fees charged by opted-out facilities and physicians. As a result, if the fee exceeds the rate that the Manitoba Health Services Insurance Corporation will pay, the individual patient must pay the difference. This completes the methods of payment utilized in the private and public sectors.

The Laboratory Segment of the Manitoba
Health Care System

All facilities in the public sector have laboratory facilities and provide these services. The large hospitals and provincial laboratories located in metropolitan Winnipeg provide all laboratory tests from the basic procedures variety to those that are complex in nature. Rural hospitals under fifty beds, diagnostic units, and the provincial laboratory at Dauphin provide laboratory tests of the basic procedures variety. Any complex tests are sent to Winnipeg for completion. The complex tests are done by larger facilities that have greater equipment and personnel resources. Usually these facilities are affiliated with the University and are the research centres in the province.

In the private sector, individual physicians or physicians in groups can provide laboratory services if they own a registered facility.¹ Other non-laboratory

1. Summary of Policies, Laboratory and Radiology Services, Manitoba Medical Services Insurance Corporation, Winnipeg, 1969, p.2. Any facility that applied for registration to the Manitoba Hospital Commission was registered.

specialists can provide any laboratory tests that are deemed to be an integral part of the practise of their specialties. In addition all items in the Laboratory Short List of the Schedule of Benefits can be performed by all qualified physicians.¹ The Short List is a list of the simple laboratory tests that the Manitoba Medical Services Insurance Corporation has decided any physician can perform and interpret adequately. Qualified physicians are those that have a license to practise medicine in Manitoba.

There are fifty-three registered privately-owned and operated facilities in Manitoba. Forty-three of these are located in metropolitan Winnipeg while the remaining ten are located in rural Manitoba. In all locations alternate facilities and services are available in the public sector. Private facilities provide basic laboratory tests and are usually lacking the expensive equipment and technical personnel required for the more complex tests. The volume levels of complex tests make them an unprofitable business for private concerns. Private practise does not have the stimulus of research as traditionally little research has been done in this sphere.²

1. Manitoba Medical Plan, Manitoba Medical Services Insurance Corporation, Winnipeg, 1969, p.39.

2. Statement made by Mr. F. Toll, Assistant Director, Research and Planning Division, The Manitoba Hospital Commission. This point was also made at the International Congress on Group Practise in Winnipeg in June, 1970 that I attended.

Future Developments

For the present time and on a temporary basis interim approval was granted to any facility that registered with the Manitoba Health Services Insurance Corporation. Registered facilities with interim approval status were eligible for payment for the services they provided while others were not. The interim approval status was granted to all facilities to allow time to set up and implement the Standard Approval Program. The objective of the Standards Approval Program with regard to laboratory services is:

to insure that an adequate standard is achieved and maintained for all laboratory services under the direction of laboratory physicians in Manitoba. It is implicit that inadequate standards must not result from economic pressures or excessive demands. It is equally important to maintain economic efficiency and avoid all unnecessary duplication of personnel, equipment and space.¹

The College of Physicians and Surgeons of Manitoba has accepted the responsibility of establishing standards in the field of laboratory medicine. A Standards Committee has been established to make recommendations regarding Laboratory Committees. Sub-Committees have been established to inspect and assess facilities in Manitoba.² The Sub-Committees have laid down standards but final evaluation

1. Standards Approval Program, Laboratory and x-ray Facilities, The Physicians and Surgeons of Manitoba Winnipeg, 1969, pp.1-2. Presently this development only applies to the Private Sector.

2. Ibid.

will be on the basis of judgment.¹ The initial inspection has not as yet started. The results will be utilized as the basis on which the status, approval, interim approval, and non-approval will be assigned to the various facilities throughout the province. This shall determine what facilities are eligible for payment from the Government agency. This inspection and evaluation process will be an on-going one.

Another expected development in the future regards the payment structure and procedure. It is hoped that the laboratory Schedule of Benefits can be broken down into technical and professional components. The technical component will be calculated to take into account:

1. Variable Expenses - salaries, supplies, utilities rent, etc. based on cost.
2. Capital Cost Allowances -
 - (a) Buildings - depreciation on the portion applicable to the diagnostic unit services at rates to be determined.
 - (b) Equipment
 - (i) depreciation based on reasonable capital cost
 - (ii) an approximate amortization period of 10 years.
 - (iii) a relationship between volume and cost.
3. Capital Investment Allowances - An allowance based on the net amount invested in diagnostic service at a rate to be considered.²

The professional component will be that portion of the total

-
1. Ibid., Appendix I and II, These documents give a complete presentation of the standards to be met by facilities in Manitoba.
 2. Insurance Out-patient Diagnostic Services, Laboratory and x-ray Outline of Policy Considerations, Manitoba Medical Services Insurance Corporation, Winnipeg, 1970, pp.1-4.

fee attributable to interpretation and administration by someone having the necessary training and qualifications.¹ Thus in the future the government agency will only pay the technical portion of fees to approved facilities and the professional portion of fees to recognized specialists.

¹. Ibid.

CHAPTER III

Theoretical Framework

Cost functions and production functions are useful tools for studying several practical problems: economies of scale, optimum input proportions, optimal levels of output, least-cost combinations of inputs at various levels of output, and the measurement of productive efficiency.¹ The following discussion briefly outlines the basic principles underlying the theory of cost and production and indicates the importance of these concepts in formulating policies which will minimize the cost of providing a high quality of laboratory services in any given year.

Cost Theory

Ferguson states:

"The physical conditions of production, the price of resources, and the economically efficient conduct of an entrepreneur jointly determine the cost of production of a business firm."²

This statement applies equally as well to a hospital, provincial department of health or private clinic. Underlying short-run cost theory are two basic assumptions:

- (1) the physical conditions of production and the unit prices of inputs determine the cost of production associated with each possible level of output; and
- (2) total cost may be divided into two components fixed cost and variable cost.³

1. Feldstein, Martin S., Economic Analysis for Health Service Efficiency, Markham Publishing Co., Chicago, 1968, p.90.

2. Ferguson, C.E., Microeconomic Theory, Richard D. Irwin, Inc., Ontario, 1969, p.184.

3. Ibid.

Basically the short-run theory of cost can be utilized to demonstrate the function relating total costs to levels of output. Subsequent to this the average cost and marginal cost functions can be derived. Cost data available for laboratory services in Manitoba does not include any data on fixed costs. Thus total cost analysis would not be possible.

However, cost data on variable costs were available and could be utilized to estimate a total variable cost curve. The total variable cost curve is defined as the sum of the amounts spent for each of the variable inputs used.¹ For laboratory services the total variable cost is the composite of professional labor costs, non-professional labor costs and other costs.

From the total variable cost curve, the average and marginal variable cost curves can be derived. The average variable cost curve is the total variable cost divided by output.² The average cost curve is the average variable cost curve adjusted to include the averaged fixed costs. Marginal variable cost or marginal cost is the addition to total variable cost attributable to the addition of one unit to output.³ These curves permit the establishment of the input combination that corresponds to economic

¹. Brennan, Michael J., *Theory of Economic Statics*, Prentice-Hall, Toronto, 1965, p.149.

². Ferguson, C.E., *Microeconomic Theory*, Richard D. Irwin, Ontario, 1969, p.190.

³. Ibid. p.192.

efficiency. This is at the point where the marginal rate of technical substitution is equal to the input-price ratio.¹ or where average cost is a minimum.²

For the purpose of this thesis, short-run will be defined as one calendar year and variable costs will be those that can vary within the short-run.

Production Theory

A production function describes the relationship in a firm between alternative quantities of physical inputs and the physical output that results from each quantity.³ The underlying assumptions are that:

- (1) firms will produce the maximum output for all combinations of inputs; and
- (2) there is a constant state of technology.⁴

The total output or product of laboratory services is a function of various labor and capital inputs. Similar to cost theory, the average and physical product curves can be derived from the total product curve. The average physical product is the amount of output per unit of the resource employed.⁵ The marginal physical product is the change in

1. Ibid. p.186.

2. Brennan, Michael J., Theory of Economic Static, Prentice-Hall Inc., Toronto, 1965, p.149.

3. Ibid. p.112.

4. Ibid. p.114.

5. Ibid. p.120.

total product that results from unit changes in the quantity of the resource used.¹ The resultant average physical product and marginal physical product for each of the variable inputs will facilitate productivity comparisons. Moreover from the production function we can infer input proportions that will achieve given output at minimum cost or equivalently, maximum output for given cost.²

Economies of Scale

The existence of substantial economies or diseconomies of scale in the provision of laboratory services would be an important determinant of the optimum pattern of laboratory size and location. Two advantages to utilizing the production function for studying scale effects are: the production function includes the use of capital among the inputs and; the results are not affected by differences in the efficiency with which laboratories of different size combine inputs.³ Economies of scale occur when the unit cost of production is reduced by increasing the size of the plant after adjusting all inputs optimally.⁴ If the increases in the percentages of factor inputs are exceeded by the resultant percentage increase in output then

1. Ibid. p.120.

2. Feldstein, Martin S., Economic Analysis for Health Service Efficiency, Markham Publishing Co., Chicago, 1968, p.90.

3. Ibid. p.90.

4. Ferguson, C.E., Microeconomic Theory, Richard D. Irwin Inc., Ontario, 1969, p.211.

economies of scale are present. If the increase in the percentages of factor inputs exceed the resultant percentage increase in output then diseconomies of scale are operating. There are three broad reasons why economies of scale result, specialization and division of labor, technological factors and the spreading of overheads. Diseconomies of scale can result from increased managerial cost with increasing plant size.

Now that the general theory of cost and production and the applications have been discussed, how does this relate specifically to the laboratory setting? To relate outputs to inputs a production function or some proxy for a production function must be utilized. This would take the general form:

$$Q = F (L_p, L_{np}, K, S, P) *$$

Total Tests $T_i - T_n$ = Function of (Labor professional, labor non-professional, capital, other supplies, type of patient).

Q = Output

F = Function

L_p = Labor Professional

L_{np} = Labor non-professional

K = Capital

S = Other supplies

P = Type of patient

Technical efficiency would be the point where the marginal

physical product of labor is equal to the average physical product of labor other factors held constant. There exists some argument regarding what constitutes the output measure for laboratories. Miss S. Toshach in this field suggested that professional interpretations are the actual outputs in laboratories.¹ I have taken the stand that completed tests are the output on the grounds that professional interpretation is only one component required to have a complete test. All tests require professional interpretation, being useless in and by themselves. Thus professional interpretation is regarded as a partial input of the system and is included in the input labor professional. If administrators had the data to calculate the above production function they would be able to relate various resulting output mixes to the input requirements utilized to produce them. Further, average and marginal product curves could be derived from this general form of the production function.

To relate outputs to costs, the general form of the cost function for laboratories is:

$$C = F (Clp, Clnp, Ck, Cs)$$

Total costs = Function of (professional labor costs,
non-professional labor costs, capital costs,
supplies costs.

$$C = \text{Total costs}$$

1. Miss S. Toshach, Bacteriologist, The Provincial Laboratory, Edmonton, Alberta. This was also suggested by Mr. J. Suddaby, Chief Technician, Winnipeg General Hospital.

Clp = Professional labor cost

Clnp = Non-professional labor cost

Ck = Capital costs

Cs = Supplies costs

If the administrators had the data to calculate the above cost function, they could derive average and marginal cost functions and utilize the results with the results of the production function to assess the efficiency of present operations and make adjustments to facilitate the attainment of a maximum output with their resources in their future operations. Economic efficiency would be the point where average cost is at a minimum.

As the above represents an essential framework for assessing the economic efficiency of the laboratory system, the present system will be analyzed in terms of its validity and adequacy at assessing economic efficiency.

CHAPTER IV

Output and Cost Measurements In The Present Laboratory System

Cost and statistical data on laboratory facilities in Manitoba can be obtained from several sources. Hospital budgets, trial balances and D.B.S. HS-1 forms, provide the best source for facilities located in hospitals.¹ Costs and statistics reported by provincial laboratories and diagnostic units are located in the Department of Health and the Public Accounts of the Province of Manitoba.² Information on the private sector is found at the Manitoba Health Services Insurance Corporation. Data on federal facilities can be obtained from the Department of Health and Social Services in Ottawa.

Cost data is reported in many different ways. Larger hospitals departmentalize costs to some extent. Further, departmental breakdowns are available that separate out non-professional salaries, professional salaries and other supplies. In smaller hospitals, neither the departmentalization of costs nor the separation of costs within departments, occurs. Information on non-departmentalized costs such as administration, housekeeping and employee benefits are not available or maintained throughout the whole system. The cost data of the Department of Health on

-
1. Annual Budgets, Manitoba Hospital Commission, 1970. All budget hospitals in Manitoba must submit an itemized annual budget for approval and D.B.S. HS-1 Forms.
 2. Public Accounts of the Province of Manitoba, Winnipeg: Queen's Printer, 1959-1968.

provincial laboratories and diagnostic units is distributed and separated out by expense classifications but some expenses are grouped for the whole system. Also the distribution of costs by diagnostic units are not distributed to the various satellite facilities within each unit. Costs in the private sector are available by facility but the composite of total costs by facility is unknown.

Statistical data is reported in several ways. The output of the various facilities is reported recording the number of examinations, the number of standard units or a combination of both these measures. Those facilities utilizing the standard unit compile these by fields as defined by the Dominion Bureau of Statistics.¹ Hospitals under fifty beds are not required to distribute their standard units by fields. Among hospitals required to distribute their standard units by field substantial variations occur in what is included in the various fields. The reporting of the number of examinations is on the wane as the emphasis has shifted to unit values, except in the private sector where the number of examinations is used exclusively. The Dominion Bureau of Statistics does not require the reporting of number of examinations except for examinations

1. 1969 Instructions and Definitions for the Annual Return of Hospitals, Form HS-1, Facilities and Services, Dominion Bureau of Statistics, Department of National Health and Welfare, Ottawa, 1969, pp.1,18,21,34,35.

referred out¹ but these figures are required by each of the facilities in order to calculate their standard units.

In response to government pressure for quantification of outputs in laboratories, backed up by the threat that the government would do it themselves, the unit system of reporting was developed. Specialists in the field took on this task as they felt they were the most qualified to do so. Prior to 1969, the Dominion Bureau of Statistics defined the standard unit as: "basically 10 minutes of time, seven minutes of technical procedures and three for other preparatory services."² A sub-committee prepared a schedule of unit values for laboratory procedures and these were utilized by hospitals for reporting laboratory work. The schedule of unit values for various tests were based on the best educated guess of specialists on the sub-committee.³ There was substantial disagreement in the field regarding unit values for the various tests and a great deal of initiative was evident in the unit values reported by facilities in the field. In 1957, the Canadian Association of

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1. Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Health and Welfare Division, Institutions Section, Ottawa, 1960, p.1.
 2. Statement made by Mr. F. Toll, Assistant Director, Research and Planning Division, Manitoba Hospital Commission.
 3. Statement made by Miss S. Toshach, Bacteriologist, The Provincial Laboratory, Edmonton, Alberta.

Pathologists reviewed and revised the scale, again based on their educated guess at the proper unit values.¹ By 1969, the schedule again required revision. Thus the unit was redefined and a new schedule was constructed. Now, the unit is equivalent to one minute of technical, clerical and aide time.²

The objectives of the new Schedule are to:

- (a) Provide a realistic assessment of the total technical, clerical and aide time consumed (including quality control, research, development, etc.) in laboratory medicine.
- (b) Recognize the effect of "automation."
- (c) Allow for the effect of varying and various patterns of laboratory medicine.
- (d) Allow for modifications.³

The new schedule was the result of a sample time study conducted in forty-nine hospitals and selected provincial public health laboratories, and represented at least eighty to eighty-five percent of the national laboratory workload.⁴ For procedures not covered in the Schedule, it was suggested a temporary value should be assigned. The value assigned should approximate a similar procedure in the Schedule.

1. Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Health and Welfare Division, Institutions Section, Ottawa, 1960, p.1. The schedule indicated the need for revision, Miss S. Toshach indicated the basis on which the revision was completed.

2. Ibid., 1969, p.1.

3. Ibid.

4. Ibid.

The new Schedule was on more solid footing than previous schedules but variations still remain. The values assigned to the various tests were based on averages within the sample. Thus the assigned values still lack substantial support in the field and variations in reported unit values for laboratory tests still occur. For procedures not in the Schedule, the values reported suffer from even wider variations in interpretation. The variations are justified on the basis of some aspect of quality.

The purpose of the unit value system was to provide a system to measure technical workloads in laboratories.¹ It was also clearly pointed out what the schedule was not to be used for.

"From the standpoint of cost analysis, this Schedule is a measure of selected components of a given laboratory service and take no account of such elements as professional supervision, space, equipment, administration, etc. Thus in itself it cannot form the basis for total cost analysis."²

The Schedule states that: "Accurate measurement of laboratory workloads is essential for the proper operation of a laboratory."³

The advantages of the unit system were: that the technical workloads of different types of laboratories such

1. Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Health and Welfare Division, Institutions Section, Ottawa, 1969, p.1.

2. Ibid., p.3.

3. Ibid., p.1.

as haematology and biochemistry were comparable and; the total units of various institutions were indications of technical workloads and could be compared. Under the previous system of recording the number of examinations, the multitude of test types made any comparisons extremely difficult even by experts in the field.

Clearly the unit system was designed to measure an input of the system, technical workloads in terms of time spent converted to a standard of unit values. The unit system was not designed to measure the output of the laboratory system.

Uses of the Schedule of Unit Values

The uses of the Schedule depend to a large extent on the user. The Dominion Bureau of Statistics utilize unit values to compile statistics quarterly and annually. They calculate national and provincial averages by hospital size and hospital type. These statistics are utilized for cross-sectional and time series comparative analysis and the results provide an assessment of health needs regarding laboratory services throughout Canada. Federal Policy on the financing and development of laboratory services will be partly determined by reviews of these results.

The institutional administrator utilizes unit value statistics as a crude measure of efficiency, as an index for changing circumstances, for inter-departmental

comparisons and as a measure of workloads. He takes his total laboratory costs, divides this figure by his total laboratory units and finds his cost per unit. The cost per unit is expected to rise over time by the amount of wage changes. If the cost per unit does not fit this expected pattern the administrator is alerted and further investigation is justified. This evaluation is done inter-departmentally and for the total laboratory. He utilizes these same statistics from other similar size and type of hospitals as a crude measure of efficiency. If his cost per unit varies unfavourably with other similar institutions, the search for justifications begins.¹ For example Table I shows the total costs, the total units and the cost per unit for the Winnipeg General Hospital and St. Boniface General Hospital.

TABLE I

Cost and Unit Statistics for the Winnipeg
General Hospital and St. Boniface Hospital
for 1967 & 1968

		<u>Total Cost</u>	<u>Total Units</u>	<u>Average Cost per unit</u>
1967	Winnipeg General	\$ 976,481	2,466,024	.396
	St. Boniface	601,930	1,685,357	.357
1968	Winnipeg General	\$1,204,066	2,208,768	.545
	St. Boniface	649,547	1,728,990	.376

¹. These uses of the unit value system by administrators were given by several administrators in the field. Mr. Joe Newhouse, Director of Finance, University of Alberta Hospital; Miss S. Toshach, Bacteriologist, The Provincial Laboratory, Edmonton, Alberta. Other administrators gave similar uses. Thus these uses are taken as being representative of the field as a whole. The concept will be examined in Chapter V.

In 1967, the unit costs are similar and efficiency would be judged as being similar. In 1968, the significant rise in average cost for the Winnipeg General Hospital would be interpreted as inefficiency both within the laboratories of this hospital and with the laboratories of the St. Boniface Hospital. This interpretation would prevail until the Winnipeg General could prove otherwise.

Substantial changes in total units are taken as justification for staff and equipment changes when a factor such as automation is not responsible. Table I above would indicate a staff or equipment decrease in 1968 for the Winnipeg General Hospital Laboratories but instead a significant cost increase is observed. Total unit fluctuations are used as justifications for changing all staff categories not just technical, clerical and aide staff. National statistics and those of other institutions that the administrator is not familiar with are regarded as being largely meaningless to him. Thus staffing and other resource requirements of laboratories are influenced significantly by the unit value statistics.

The last users of unit value statistics are the government agencies. These agencies utilize unit statistics as broad indicators for changes and efficiency indicators throughout the province. The bulk of the assessment of the system is done by line budget comparisons in the negotiation process.

CHAPTER V

A Critical Analysis of Efficiency and Cost Comparisons Based on the Unit Value System

Chapter III indicated the essential economic framework that should be used to evaluate the laboratory system. Chapter IV presented how the unit system has been implemented in the laboratory system and the manner in which this system is utilized as the basis for quantitative efficiency measures within the laboratory system. The objective of this chapter is to examine the overall effectiveness of this measure.

Failure of the Unit System to Meet its Stated Objectives

One objective of the unit value system as set out in the new Schedule was to provide a realistic assessment of the total technical, clerical, and aide time consumed in laboratory medicine. This objective cannot be achieved for the simple reason that fifteen to twenty percent of laboratory tests have not been assigned a unit value.¹ An attempt is made to avoid this problem in the sense that the schedule states that the value of a similar test should be assigned for these excluded tests; however this presupposes that

¹. Canadian Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Ottawa, 1971, p.2.

similar tests are listed in the schedule. This assumption does not hold; therefore, individual laboratories are forced to make up their own unit values. The net result is that the comparability and consistency of the unit system is destroyed for inter-laboratory comparisons. As an example of the problems accentuated by this situation, one can consider the case of some of the larger laboratories, such as the Winnipeg General Hospital, and the provincial laboratories where these excluded tests comprise a significant proportion of their total workloads. In these situations, the realism of the assessment of technical workloads can be seriously questioned. The reported total units may be realistic to the administrator of the laboratory but this assessment may or may not comply with being realistic in terms of the schedule. The unit value schedule states under Clinical Chemistry that: "All standards, quality control sera duplicates and repeats should be considered as additional procedures and assigned the same unit as the unknown specimen".¹ In these situations much of the procedures do not require repetition such as documentation, and sample collection but the full test unit values are recorded. Under these conditions institutions that have large numbers of repeats included in their total unit values would not be distinguishable from others. The total units in these cases are not accurately assessed.

1. Canadian Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Ottawa, 1971, p.13.

The second objective that the new schedule attempted to achieve was the recognition of the effect of automation. It attempted to achieve this end by providing new standards for tests done on auto-analysers etc.; however the schedule did not provide new standards for automation which included any change in the workload of clerical workers or aids. Thus the introduction of an automated bottlewasher or electric typewriters would not result in any changes in the composite unit test values which could have decreased or increased the total labor inputs required per test. The net result of this state of affairs is that it is difficult to isolate the effects of automation in the actual technical performance of laboratory tests from automation which affects the supportive functions. For example, the schedule lists the test - Urea nitrogen, quant. - urine at manual 13 units automated 6 units and automated simultaneous 4.5 units. The unit values are adjusted downward to account for the decreased technical workloads required due to automation. The adjustment is for the technical labor input of the defined technical workloads and assumes the clerical and aide labor inputs are constant before and after the implementation of the automated technique.

It should be noted that the adjustment of technical workloads ensures that observed changes in total units will not be inflated because of the introduction of automated equipment unless increases in tests occur beyond the capacity increase in technical labor inputs. Previously the units

for tests done manually and by automated equipment were assigned the same unit value even though the technical labor input requirements were much less. Thus laboratories were reporting inflated total units due to automation which in no way reflected their technical workloads. For example if 10 of the above tests remained the same, the total units recorded would be 130 units under manual operations and 45 units if they were automated simultaneous. The total units reported would decrease under these conditions unless the number of tests increased by approximately 19. The net result is that the same input of technical labor could produce approximately three times the number of tests via the automated as compared to the manual system. Thus in order for laboratories to maintain previous levels of total units there must be an increase such that the increased capacity of technical labor inputs resulting from the automated technique are fully utilized. The point at issue is that while technical labor productivity may have increased 300 percent there is no apparent method of determining the effect on the productivity of the technical components. In effect the schedule does not account for the effects of automation on all the inputs that are a part of this measure such as clerical and aide inputs. Further, automated test unit values are averages for certain sizes of test batches up to batch size of 12 tests. Many laboratories have test batches that exceed 12 tests and the assigned test values are not accurate in terms of technical workload requirements for these large

test batches. If we couple these results with the fact that no cognizance has been taken of the effect of automation on non-labor supplies or professional labor inputs it becomes evident that we do not have quantitative measures of the total effect of automation in the efficiency and costs of laboratory services. It is impossible to obtain a clearcut measure of the effect of automation or an indication of the potential changes in the organization and patterns of delivery within the system.

The third objective of the new schedule was to attempt to allow for the effect of varying and various patterns of laboratory medicine.¹ In order to achieve this end the schedule was established in such a manner that the various tests were broken down into their simplest procedures. In addition automated techniques are assigned different unit values as well. The effect of any additional procedures were to be isolated and valued separately.

The Unit Value as a Measure of Efficiency
and Output

The next major point of interest at least from an economic point of view is the utility of the unit value system for assessing efficiency in laboratories. We have noted that one major problem with the unit value system is that it is just a partial measure of selected components or technical workloads in laboratories. It takes no account of

¹. Schedule of Unit Values for Clinical Laboratory Procedures, Dominion Bureau of Statistics, Health and Welfare Division, Institutions Section, Ottawa, 1960, p.1.

such elements as professional supervision, space, equipment, administration, professional interpretations etc. As a result this measure as a proxy of laboratory output excludes many elements that can have a direct influence on output levels. Since the relationships between the technical workload requirements and the other input requirements have not been demonstrated, the validity and reliability of utilizing units as proxies for output is questionable. Furthermore, there is no other measure utilized that accounts for the excluded factors except number of examinations and these statistics are not maintained above the individual institution level.¹

There are some additional problems that must be considered if one is to attempt to use unit values as output proxies. These problems are centred around the composite value of the unit value. The unit includes technical, clerical and aide time and the composition of a unit is not given, however it is not clear whether it is split equally between the three elements. It could be forty seconds of technical time, ten seconds of clerical time, and ten seconds of aide time, or any other possible mix. As a result all elements are given equal weight by practitioners and one minute of time spent by any of the elements is recorded as a unit of output. This implies that a test unit

1. Statement made by Mr. F. Toll, Assistant Director, Research and Planning Division, The Manitoba Hospital Commission. A Review of the Required HS-1 Forms indicates that this information is not required and no space provisions are made for it.

value of fifteen units is some unknown composite of any combination of the three elements.

This ambiguity creates a number of problems with respect to interpretation in the sense that there is substantial lack of support in the field for the various unit values assigned per test.¹ Since practitioners do not know the composition of the elements - labor time components - in a stated unit value for a test, they consider that the whole system is open to question. Therefore, if they find that their test unit values consistently exceed the stated unit values in the schedule they promptly adjust their reported values. For example, justification given was that because technicians had to travel to another building to do certain tests, a higher unit value was reported for these tests.² Another popular argument is centred around the belief that there are substantial variations in quality. It is suggested that this could result in inefficiency and quality being shrouded under the same cape.

Comparisons Based on the Unit Value System

To illustrate the difficulties of comparative analysis in the laboratory system, the metro-hospitals will be utilized. Table II gives the percentage distribution

1. Statement made by Miss S. Toshach, Mr. J. Suddaby and other people in this field.

2. Statement made by J. Newhouse, Finance Director, University Hospital, Edmonton, Alberta.

and rank of metro-hospitals in terms of costs and total units. This table indicates that percentages of costs and percentages of reported laboratory units are similar, or if one accepts that units are a proxy for output, that output percentages and cost percentages are similar. For example, the Winnipeg General Hospital has 42.3 percent of the total costs while providing 38.0 percent of the total service. In the light of our previous comments it is a useful exercise to attempt to carry out a comparison of the laboratory units. The problem is that each hospital has distinctive characteristics that make it incomparable to the next. These are centred around different input mixes, individual interpretations of the schedule etc. A comparison of two hospitals will clarify this point. Table II indicates that Concordia Hospital reported 83,280 units and costs of \$42,055 while Victoria Hospital reported 170,204 units and costs of \$106,618. The point of issue is what can we say about relative efficiency by comparing the costs and units of these two hospitals assuming that their interpretations of the schedule of unit values was identical? Casual observation indicates that Victoria Hospital's workload was approximately double that of Concordia Hospital's on this basis, while their costs were approximately two and one-half times greater. One would suspect that something at Victoria must be responsible for the greater costs at their level of output. The point is without knowing the input combinations of these two hospitals we don't know what basis we are comparing them on. Concordia Hospital has approximately fifty beds while Victoria Hospital has two

TABLE II

SCHEDULE B - LABORATORY SERVICES - 1968

Hospital	Total Cost	% of Total Cost	Rank	Total Units	% of Total Units	Rank	Cost Per Unit
Winnipeg General	1,204,066	42.3	1	2,208,768	38.0	1	.545
St. Boniface	649,547	22.8	2	1,728,990	29.8	2	.376
Misericordia	292,168	10.4	3	513,732	8.8	4	.569
Children's	273,386	9.6	4	603,937	10.4	3	.453
Grace	166,142	5.8	5	343,014	5.9	5	.484
Victoria	106,618	3.8	6	170,204	2.9	6	.626
Municipals	74,436	2.6	7	93,582	1.6	7	.795
Concordia	42,055	1.5	8	83,280	1.5	8	.501
Manitoba Rehabilitation	31,067	1.1	9	59,836	1.0	9	.519
St. Vital	4,542	0.1	10	6,915	0.1	10	.657
Total	2,844,027	100.0		5,812,258	100.0		.489

hundred and fifty beds. Concordia is largely an extended care facility while Victoria is an acute care facility. Concordia has an old plant and equipment while Victoria plant is brand new and its equipment is relatively new. Concordia methods are largely manual while Victoria has considerably more automation. Their test mixes would differ considerably necessitating different professional labor mixes. Thus the comparison of these aggregate statistics is meaningless because we don't know if the indicated differences are real ones or why they occur. As such it is strongly suggested that no judgments can be made as to the relative efficiency of laboratories within or between hospitals. In addition one cannot infer utilization rates from unit value statistics. The total units gives no indication of the number or type of tests that have been performed in a laboratory. As a result unit value statistics give little indication of utilization rates for various laboratories.

The Effect of the Organizational Structure
on Efficiency, and Cost Comparisons Within
the Laboratory System

In addition to the shortcomings of the schedule and the lack of utility of comparative statistics, organizational problems introduce problems in trying to develop comparative statistics and efficiency measures. There are four agencies or departments with responsibility for the systems or various segments of laboratory services in

Manitoba. Each system has retained its individuality and as a result inter-agency comparisons are difficult and in some cases impossible. For example it is exceedingly difficult if not impossible to compare cost per test statistics in the private sector to cost per unit statistics in the other sectors. Greater problems result when information is just not collected by these agencies and one is forced to go to the individual institutions level or worse yet to the department level. The diversity in quantity and type of data at these levels is immense.

These problems are supported by several examples. The Department of Health and Social Development record their data on a fiscal year basis while the Manitoba Hospital Commission and Manitoba Health Services Commission record their data on a calendar year basis.¹ These two accounting periods result in different cost behavior patterns in the various systems. This fact prevents conversion of the data to one period either fiscal or calendar without producing distortions in cost behavior patterns.

Adequacy of Information

The lack of information problem is amply demonstrated by the data on rural hospitals under fifty beds. Statistics and costs are reported in aggregate form, for

¹. Mr. E. Singleton, Director of Finance, Department of Health indicated their fiscal year basis while Mr. R. Edwards, Director of Finance of the Manitoba Hospital Commission indicated their annual accounting period.

instance, in the Teulon Hospital in 1968 the laboratory costs were \$13,589 and the output was 20,380 units, also in the same year the Thompson Hospital reported laboratory costs at \$14,366 and output of 40,204 units.¹ Lacking even the crudest distribution of costs for the Teulon and Thompson Hospitals' laboratories prevents even a cursory review of cost patterns in these two hospitals. There is also a problem with the reported outputs of 20,380 units for Teulon and 40,204 units for Thompson. What composition of test types resulted in these totals? Without these answers output analysis is impossible. At first glance it appears that we are getting almost twice the output from Thompson for very little more cost; however, this is a very tenuous conclusion in the absence of data on efficiency measures in the two laboratories; data on the equipment utilized in each laboratory, data on the volume and test types done in each of the laboratories and referred out and data on expenditures in the two laboratories. Data on any one of these facets could change the initial conclusion. While much of this data is not available at the agency level it can usually be found at the institution level in some form.

Information on capital equipment is a problem for all agencies and institutions. All major capital expenditures require approval at the agency level and recording

¹. HS-1 Dominion Bureau of Statistics. Forms located at the Manitoba Hospital Commission.

takes place during this process. Beyond this, agencies do not keep track of capital equipment. Even large institutions do not maintain equipment ledgers, and do not know the equipment inventory values in their laboratories. As a result, trying to value the capital equipment inputs for laboratories in Manitoba is extremely difficult.

The multiple agencies introduce problems of communications and access both inter-agency within the province and between federal and provincial agencies. These problems are political realities as each agency has: an axe to grind; a territory to defend; a health budget to fight for; etc. Some experience with bureaucratic red tape soon indicates the pervasiveness of this form of protectionism. There exists a vast system of approval for access and purpose and as well a restriction on release of any results until approval has been granted. This is not to suggest that the red tape should not exist for outsiders but rather that it should not exist on the inter-agency basis.

Another major organizational problem exists in the individual accounting systems. There are variations in standards within and between agencies. Smaller institutions meeting minimum standards report strictly on an aggregate basis. The problems that result were discussed earlier. Larger hospitals provide much greater detail on their costs but variations within and between cost classifications still occur. St. Boniface General Hospital does not assign all

its supplies and other expenses to its individual laboratories instead it groups some of the supply expenses under: Laboratory-shared facilities and Laboratory office and Outside laboratory. The Winnipeg General Hospital on the other hand assigns all supplies expense to individual departments. These individual expense classifications confound comparative analysis between institutions.

Another organizational problem results from the agencies' difficulties in forcing institutions to meet deadlines with regard to information reporting. The delay in the availability of required data prevents early analysis and corrections or adjustments that may be indicated. A delay may decrease the utility of the analysis performed making the whole exercise a waste of time.¹ It is doubtful if this time lag will be corrected in the near future.² Small institutions lack the personnel with the necessary skills and also attach less importance to their data than large institutions. The lack of control over private facilities makes it difficult to force them to meet deadlines. Further, for those institutions required to report, late reporting has not resulted in any disadvantage for

1. Hirsch, Rudolph, The Value of Information, The Journal of Accountancy, June, 1968. Hirsch discusses the timeliness of information, and how the passage of time can decrease the value of information.

2. Statement made by Mr. F. Toll, Assistant Director, Research and Planning Division, The Manitoba Hospital Commission.

delinquent institutions. Agencies have the power to withhold funds from delinquent institutions but this power has never been exercised.¹ Agencies experience difficulty in trying to assess an institution's future needs without knowing the operating results of the past several periods. Examples are Concordia Hospital and Grace Hospital which had not submitted their 1969 operating results even though it was well into 1970 and most hospitals were preparing their 1971 budget submissions.

1. Statement made by Mr. F. Toll, Assistant Director, Research and Planning Division, The Manitoba Hospital Commission.

CHAPTER VI

Summary

Assessment of efficiency and effectiveness of health systems has not been done successfully in the past. This attitude and performance on the part of health officials is no longer acceptable to the rest of Canada. This thesis presents the structural realities of the laboratory system in Manitoba and assesses the evaluation process as it operates in the present system. The resources allocated to the laboratory system require evaluation if improvements in allocations are to result. The relative efficiency of the individual laboratory units and sections must be delineated to assess the pattern of allocation of resources. The present system fails to meet these requirements because of data shortcomings and structural difficulties in the system. These deficiencies must be overcome if a more rational allocation of resources is to be attained in the future.

Conclusions

The first major conclusion is that the unit system does not provide a realistic assessment of technical workloads. This results from inherent weaknesses of the schedule itself and from poor applications by those in the field. If these problems can be overcome accurate assessments of technical workloads can be achieved utilizing the schedule of unit values.

The present system is inadequate because of the

above problems but even if these were overcome, the unit system is still not adequate as a proxy of output. The unit system does not account for or include the effects of such significant factors as capital inputs or professional inputs. These and other factors can significantly affect the output in laboratories but have no effect on the technical workload requirement of the system. Since the laboratory system does not report the number of examinations any more, the second conclusion is that the system has no measure of their output.

The third conclusion of this thesis is that the laboratory system does not have any quantitative measures of efficiency in the system. Cost per unit statistics do not represent measures of efficiency in laboratories. They are simply indices showing how various combinations of the total inputs -- technical, clerical, aide, labor -- relate to other input costs in the system. As a result no one within or outside the system can justify or criticize efficiency or non-efficiency in the system because measures of efficiency do not exist and quantitative evaluations of efficiency are impossible in the system as it now exists.

The fourth conclusion is that the present laboratory system is unable to ascertain utilization rates. Resources may not be allocated to laboratories where the utilization is highest or demand the greatest because these facilities cannot be distinguished from others.

The organizational structure contributes to the

inability to assess efficiency. The structure is inadequate to assess and utilize the data requirements necessary to evaluate effectiveness and efficiency in the total system. Unless objectives can be meaningfully defined in terms of units so that a certain number of units represents a certain level of care or so many examinations, the evaluation of how well objectives have been achieved will be impossible. Moreover, judgments regarding levels of care for different areas cannot be made except where differences are extremely large. Several problems contribute to the difficulty of developing efficiency measures for the system. The lack of standardization of data requirements between and within sections under the same and different government agencies confounds the development of efficiency measures that could be utilized throughout the system. The problem of non-availability of data on inputs and outputs of the system makes efficiency analysis impossible. Capital equipment is a major example. Finally the irresponsible acceptance of late reporting of the costs of various institutions would make efficiency measures if they were developed largely useless as allocations of resources would occur prior to the assessment of the system.

Another conclusion of this thesis is that the laboratory system has not examined the issues of economies of scale, alternate methods of delivering the service, productivity of factor inputs, and least-cost comparisons of existing methods of delivery. Furthermore, the unit system

does not facilitate the examination of these issues because it is inadequate by itself to achieve this objective.

Recommendations

The criticisms presented in this thesis have been largely negative rather than constructive. The criticisms indicate the need for a socio-economic approach to problems in the field of laboratory medicine. An evaluation of the benefits received relative to the resources expended is required on a continuing basis. The application of an economic model has not been utilized since "needs" have served as a sufficient justification in the past. This approach is not adequate and is no longer acceptable.

While this thesis does not attempt to suggest definitive solutions to the problems that exist, some general recommendations seem to be indicated.

Economic applications in this field are going to require administrative expertise which has not been available in the past. It is suggested that training based solely on clinical expertise is not suitable to adequately perform this role. This suggests that there should be a re-appraisal of the skill requirements of administrators in the laboratory segment of the health care delivery system.

In addition, some effort should be devoted to standardization throughout the laboratory system. It is suggested that a central agency or information bureau for

the whole province should be established having complete access to all facilities. This agency could facilitate standardization by education; evaluate existing and future data requirements; apply economic models suitable for efficiency measures, and; perform the necessary analysis and dissemination of the results so that efficiency and effectiveness are evident to those that make resource decisions in the system.

As a final recommendation, it is strongly suggested that a quantitative examination is required to determine if the units utilized in different types of laboratories such as Bacteriology and Haematology are the same or in fact that different units are being compared. This study would require that these laboratories be under very similar circumstances. Similar plants, equipment, staff mixes and numbers of patients, patient loads and administration would reduce the discrepancy factors and facilitate valid results. Further, if this study were done in several different laboratories the reliability and comparability of the unit system could be quantitatively evaluated and its utility in laboratory medicine conclusively determined.

In conclusion, it is suggested the most important implication that can be drawn from this thesis is the observation that socio-economic analysis has not been utilized in the field of laboratory medicine and that socio-economic analysis could be extremely useful. The prime

function of socio-economic analysis is to provide a framework that allows the comparison of the many alternative ways of allocating scarce resources. It is suggested that on the basis of the examination conducted in this thesis that it is virtually impossible to achieve an optimal allocation of resources within the laboratory system in Manitoba unless there is a significant improvement in the quantitative methods of reporting data in the system.

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- All available files, minutes and correspondence were reviewed in addition to the above articles. It took a considerable amount of time to read and re-read all the

material contained in the above files. Much information has been gleaned from these files and although there is no direct reference, they did form the foundation for a large part of this thesis.

APPENDIX

HOSPITAL DISTRICTS IN NUMERICAL ORDER

No.1 (3 units) Swan River Hospital District

Swan River District Hospital
Birch River Medical Nursing Unit
Benito Medical Nursing Unit

No.2 Roblin Hospital District

No.3A Gilbert Plains Hospital District

No.3B Grandview Hospital District

No.4 Russell Hospital District

No.5A McCreary Hospital District

No.6 Birtle Hospital District

No.7 (2 units) Shoal Lake Hospital District

Shoal Lake District Hospital
Rossburn Medical Nursing Unit

No.7A Hamiota Hospital District

No.8 Minnedosa Hospital District

No.8A Erickson Medical Nursing Unit District

No.8B Sandy Lake Medical Nursing Unit District

No.9 Neepawa Hospital District

No.10 (3 units) Virden Hospital District

Virden District Hospital
Elkhorn Medical Nursing Unit
Reston Medical Nursing Unit

No.11 (2 units) Souris Hospital District
Souris District Hospital
Hartney Medical Nursing Unit

No.12A Carberry Hospital District

No.12B Wawanesa Medical Nursing Unit District

No.12C (Rivers) Riverdale Hospital District

No.14 (2 units) Deloraine Hospital District
Deloraine Memorial Hospital
Dr. Wilson Memorial Hospital (Melita)

No.15 (3 units) Turtle Mountain Hospital District
Killarney and District General Hospital
Boissevain, Morton and Minto Memorial Hospital
Cartwright Medical Nursing Unit

No.16A Baldur Hospital District Hospital

No.16B Glenboro Medical Nursing Unit District

No.17 Gladstone Hospital District

No.18 Portage Hospital District

No.18A (MacGregor) North Norfolk-MacGregor Medical
Nursing Unit District

No.19 (Treherne) Victoria South Norfolk Hospital
District

No.19B Notre Dame Medical Nursing Unit District

No.19C (Swan Lake) Lorne Memorial Medical Nursing
Unit District

No.20 (2 units) Carman Memorial Hospital District
Carman Memorial District Hospital
St. Claude Medical Nursing Unit

No.21 (3 units) Morden Hospital District
Morden District Hospital
Manitou Medical Nursing Unit
Pilot Mound Medical Nursing Unit

No. 22 Crystal City Memorial Hospital District

No.23 (Bethel Hospital) Winkler Hospital District

No.24 Altona Hospital District

No.25 (2 units) Morris Hospital District
Morris District Hospital
Emerson Medical Nursing Unit

No.26A Ste. Anne Hospital District

No.26B (Stonewall) Doctor Evelyn Memorial Hospital District

No.27 Steinbach Hospital District

No.27A (St. Pierre) DeSalaberry Hospital District

No.28 Vita Hospital District

No.29 Beausejour Hospital District

No.29A Whitemouth Medical Nursing Unit District

No.31 Selkirk General Hospital District

No.33 (Teulon) Hunter Memorial Hospital District

No.34A (Ashern) Siglunes Medical Nursing Unit District

No.35 Fisher Branch Medical Nursing Unit District

No.36 Arborg Memorial Hospital District

No.37 Churchill Hospital District

No.38 Lynn Lake Hospital District

No.39 Gimli Hospital District

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